Abstract of the Disclosure

A method and system for spectroscopic ellipsometry employing reflective optics to measure a small region of a sample by reflecting radiation (preferably broadband UV, visible, and near infrared radiation) from the region. The system preferably has an autofocus assembly and a processor programmed to determine from the measurements the thickness and/or complex refractive index of a thin film on the sample. Preferably, only reflective optics are employed along the optical path between the polarizer and analyzer, a sample beam reflects with low incidence angle from each component of the reflective optics, the beam is reflectively focused to a small, compact spot on the sample at a range of high incidence angles, and an incidence angle selection element is provided for selecting for measurement only radiation reflected from the sample at a single, selected angle (or narrow range of angles). The focusing mirror preferably has an elliptical shape to reduce off-axis aberrations in the focused beam. Some embodiments include both a spectrophotometer and an ellipsometer integrated together as a single instrument. In such instrument, the spectrophotometer and ellipsometer share a radiation source, and radiation from the source can be focused by either the spectrophotometer or the ellipsometer to the same focal point on a sample. Preferred embodiments of the ellipsometer employ a rotating, minimal-length Rochon prism as a polarizer, and include a spectrometer with an intensified photodiode array to measure reflected radiation from the sample, and a reference channel (in addition to a sample channel which detects radiation reflected from the sample).